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Docket No.: M4065.0069
(PATENT)

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9/19/01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of:
Derderian, Garo J.

Application No.: 09/121,528

Group Art Unit: 1762

Filed: July 23, 1998

Examiner: T. Meeks

For: CONTINUOUS GOOD STEP COVERAGE
CVD PLATINUM METAL DEPOSITION

APPELLANT'S REPLY BRIEF UNDER 37 CFR § 1.193

Commissioner for Patents
Washington, DC 20231

Dear Sir:

This Reply Brief pursuant to 35 U.S.C. § 134 and 37 CFR § 1.193 in the above-identified U.S. Patent application is in response to the Examiner's Answer (Paper No. 26) mailed July 13, 2001.

For at least the following reasons, Appellants respectfully submit that the statements presented in the Examiner's Answer add nothing that would bolster the failure of the final Office Action to establish a *prima facie* case of obviousness. In support of certain of Appellant's remarks contained herein, attached hereto as Exhibit A is the Declaration of Cem Basceri, Ph.D.

STATUS OF CLAIMS

The statement of the status of the claims contained in the Examiner's Answer (page 2, Section (3)) is ambiguous. Appellants respectfully suggest that a more accurate description is as follows:

This is an appeal from the final rejection of all of pending claims 1-4, 6-10, 12-36, and 46-68 as presented in the Office Action of August 18, 2000.

GROUPING OF CLAIMS

The assertion in the Examiner's Answer (pages 2-3, Section (7)) that Appellants "have provided *no* reasons as to why the subject matter of these claims is separately patentable from the other claims" (emphasis added) is respectfully deemed to be incorrect and prejudicial to Appellants' interests on appeal.

In the Amended Brief on Appeal (page 4, Section VII), Appellants state that "[t]he reasons why the Appellant believes the claims to be separately patentabl[e] are set forth in the Argument section of this Brief." As evidence of the fact that Appellants *have* indeed provided such reasons, Appellants point to, for example, Brief page 5, Section VIII, where Appellants state that the following:

> Independent claims 56, 61 and 66 relate to a method for depositing a platinum group metal on a substrate according to which the platinum group metal is deposited onto a substrate in a CVD deposition chamber in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" and at "a predetermined temperature of from about 200°C to about 300°C." *Dependent claims* 57, 62 as well as independent claim 66 *further recite that the predetermined*

> *deposition time is "of about 45 seconds to about 1000 seconds." Dependent claims* 58, 63 and 68 *further limit the deposition time to "about 75 seconds to about 150 seconds." These parameters are not disclosed or suggested by Baum et al.* ("Baum") (emphasis added).

Thus, contrary to the assertion of the Examiner's Answer, Appellants *have* identified limitations present in the dependent claims that support the assertion of separate patentability, and *have* explained why the subject matter of these claims is separately patentable (i.e., "[t]hese parameters are not disclosed or suggested by Baum et al."). For example, even if the invention as defined in one of the above-identified independent claims was found to be obvious over Baum, each of the dependent claims would still define a patentable invention, since the claims include limitations neither taught nor suggested by Baum. Furthermore, each section of Appellants' Brief (i.e., in response to the various grounds of rejection) presents analogous reasons for the separate patentability of the claims.

ARGUMENTS

The grounds of rejection presented in the final Office Action and the arguments presented in the Examiner's Answer (pages 10-13, Section (11)) fail to establish a *prima facie* case of obviousness with respect to each group of claims on appeal. Baum, Kwon, and Chen, either alone or in any of the applied combinations thereof, neither teach nor suggest the limitations of claims 1-4, 6-10, 12-36 and 46-68.

First, no *prima facie* case of obviousness has been established because the references, alone or in combination, fail to either teach or suggest *all* of Appellants' claim limitations. As acknowledged by the Examiner himself, "Baum fails to explicitly teach the

deposition conditions such as total flow rate of oxygen and nitrous oxide, deposition time and film thickness, deposition pressure, etc." (Examiner's Answer, page 10.) Secondary references Kwon and Chen add nothing to remedy the deficiencies of Baum in this regard.

Secondly, there is no suggestion or motivation in the references either to modify a reference, or to combine reference teachings, so as to arrive at the claimed invention. For example, with regard to claims 61-68, Kwon is silent as to any mixture of oxygen and nitrous oxide, or as to any total flow rate of oxygen and nitrous oxide, much less about a predetermined deposition time for a predetermined total flow rate of oxygen and nitrous oxide. Like Baum, Kwon is silent as to a predetermined temperature for platinum deposition conducted with oxygen and nitrous oxide at a predetermined total flow rate of oxygen and nitrous oxide. Furthermore, though Chen discloses platinum deposition in an atmosphere of *hydrogen* and *argon* at *atmospheric pressure*, Chen fails to disclose any features of the claimed invention, such as, for example, the deposition of platinum in the presence of both oxygen and nitrous oxide at a predetermined total flow rate and at a predetermined pressure range.

In addition, nothing in Kwon or Chen suggests the desirability of applying a deposition pressure other than 2 Torr *or* 760 Torr. The final Office Action concluded that "it would have been obvious to have used deposition pressures in this range (2 Torr to atmospheric (760 Torr)) which overlaps with the claimed ranges because these deposition pressures would have been expected to be effective for depositing the platinum films by CVD with these precursors." Neither Kwon nor Chen, however, even remotely suggests

any *range*, let alone the range asserted by the Examiner. Kwon discloses vaporizing the platinum source at "reduced pressure (2.0 Torr)." Chen discloses the deposition of platinum in "an atmosphere" (i.e., 760 Torr). There is no suggestion in either Kwon or Chen that the disclosed deposition could be effected across such a wide range of pressures.

Thus, while there is no such suggestion or motivation in any of the applied references of Appellants' claimed features, the Examiner seeks to overcome these deficiencies by concluding that "these parameters [i.e., the aforementioned Examiner-described "deposition conditions such as total flow rate of oxygen and nitrous oxide, deposition time and film thickness, deposition pressure, etc."] are clearly result effective and it would have been within the ordinary level of skill in the CVD art to determine values for these parameters through routine experimentation for optimization." (Examiner's Answer, page 10.)

In support of this conclusion of "routine experimentation" to *discover* the process limitations taught and claimed by Appellants, the Examiner states, for example, the following:

> To assert that the knowledge that "the longer one deposits a film, the thicker the film becomes" would be within the level of knowledge of the ordinary artisan in the CVD art, is not an unfair assertion. One of ordinary skill in the art would clearly be aware of the relationship between [the] amount of time of depositing and how thick the film becomes and therefore would recognize these deposition parameters as result effective." (Examiner's Answer, pages 11-12.)

For the following reasons, Appellants respectfully submit that the above quotation exposes the flaw in the Examiner's logic that Appellants' claimed parameters could be discovered through routine experimentation. The Examiner's conclusion oversimplifies the nature of chemical vapor deposition.

It would not be a matter of "routine experimentation" to determine the flow rates of oxygen and nitrous oxide in a platinum deposition process because numerous, often counteracting, process variables of a complex nature are involved. Attached hereto as Exhibit A in support of this position is the Declaration of Cem Basceri, Ph.D. As stated by Dr. Basceri:

> Excessive dilution of a precursor gas or of a metal-containing gas can in fact ultimately have a detrimental effect, leading to poor step coverage. Such dilution of a metal containing gas can occur if the flow rates of the oxidizer and/or the inert gases are increased beyond a certain limit during a deposition process. For example, during the deposition of titanium nitride (TiN), as the flow rate of the carrier gas increases at the beginning of the deposition process, the deposition rate of TiN and the step coverage also increase accordingly. Further increases in the amount of the carrier gas will negatively affect the deposition rate of TiN and its step coverage, however, because the precursor gas ultimately becomes too diluted.

Thus, in deposition processes employed in the semiconductor industry, increasing the flow rate of even one oxidizing gas will at some point *decrease* the step coverage because the precursor gas becomes diluted. Determining the point at which such a decrease in step coverage will occur is not simply a matter of "routine" experimentation, but rather, may be a determination that is dependent upon the interaction of numerous process variables.

Therefore, the Examiner's statement that "the longer one deposits a film, the thicker the film becomes" is a gross oversimplification of the nature of chemical vapor deposition, and is *representative* of the less-than-convincing logic employed in formulating all of the grounds of rejection. The statement that "the longer one deposits a film, the thicker the film becomes" is only accurate under very limited conditions; as indicated above, increasing the flow rate of even one oxidizing gas will at some point *decrease* the step coverage because the precursor gas becomes diluted.

Appellants respectfully submit, therefore, that the grounds of rejection presented in the final Office Action fail to establish a *prima facie* case of obviousness with respect to each group of claims on appeal. Furthermore, the arguments presented in the Examiner's Answer simply serve to illustrate that the Examiner's *sole* support for the rejections, the assertion of "routine experimentation" to discover Appellants' claimed process parameters, is at best a gross oversimplification of the process variables that would be encountered by one skilled in the art.

Appellants respectfully submit that the rejections of claims 1-4, 6-10, 12-36, and 46-68 under § 103(a) are in error, and request that each of the final rejections be reversed.

Dated: September 13, 2001

Respectfully submitted,

By_____

Thomas J. D'Amico
Registration No.: 28,371
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526

(202) 828-2232
Attorney for Appellant